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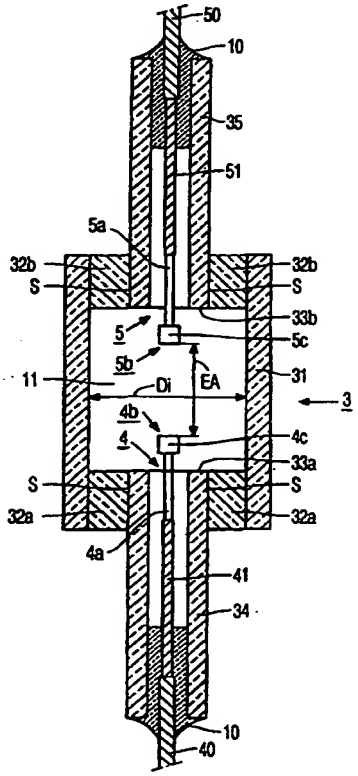
(54) Title: METAL HALIDE LAMP

(57) Abstract

The invention relates to a metal halide lamp intended to be operated on an electronic ballast, comprising a discharge vessel (3) having a ceramic wall enclosing a discharge space (11) which contains an ionizable filling comprising, in addition to Hg, a quantity of Na halide, two electrodes (4, 5) with tips (4b, 5b) being arranged at mutual distance EA, the discharge vessel having an internal diameter Di at least through the distance EA such that the following relation is satisfied: EA/Di ≥ 2.5 while the lampe has a nominal lampe voltage Vla of ≥ 110 V.



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Metal halide lamp.

The invention relates to a metal halide lamp intended to be operated on an electronic ballast, which lamp comprises a discharge vessel having a ceramic wall enclosing a discharge space which contains an ionizable filling comprising, in addition to Hg, a quantity of Na halide, two electrodes with tips being arranged at a mutual distance EA, and the discharge vessel having an internal diameter Di at least through the distance EA.

A lamp of the type described in the opening paragraph is known from WO 97/42650. The known lamp, which has eminent color properties (inter alia, general color rendering index $Ra \geq 80$ and a color temperature T_c of 3000 K), is integrated with the electronic ballast in the form of a switched-mode power supply (smps) and is thus very suitable as a light source for, inter alia, interior lighting. This lamp is based on the recognition that a good color rendition is possible when Na halide is used as a filling constituent of a lamp and a strong widening and reversal of the Na emission in the Na-D lines occurs during lamp operation. This requires a high temperature of, for example, 1170 K (900°C) of the coldest spot T_{kp} in the discharge vessel. When reversing and widening the Na-D lines, these take the shape of an emission band in the spectrum with two maxima at a mutual distance $\Delta\lambda$.

The requirement for a high value of T_{kp} results in a relatively small discharge vessel, which, in the practical lamp, leads to a wall load of 70 W/cm^2 measured across the internal surface area of the cylindrical part of the discharge vessel through the distance EA. The required high temperature precludes the use of quartz or quartz glass for the wall of the discharge vessel and necessitates the use of ceramic material for the wall of the discharge vessel.

The ceramic wall in this description and claims is understood to mean both a wall of metal oxide such as, for example, sapphire or densely sintered polycrystalline Al_2O_3, or metal nitride, for example AlN.

The electronic ballast comprises a high-frequency converter which converts, as smps, the low-frequency power supply of the mains into a high-frequency current through the lamp. In this case, it should be ensured that the high frequency is chosen to be such that it does

not give rise to acoustic resonance phenomena in the lamp. Another, generally used configuration as an smps for high-pressure discharge lamps consists of a concatenation of rectifier means, a preconditioner, a converter and a commutator to which the lamp is connected. The preconditioner is used for generating a DC voltage for power supply of the converter while withdrawing a current which is sinusoidal in a satisfactory approximation from the mains operating as the power supply source. The commutator provides for an, often low-frequency, AC current through the lamp. Both forms of the electronic ballast are designed in such a way that the voltage across the lamp is approximately 90 V in the nominal operating condition of the connected lamp. It is thereby achieved that the relevant electronic ballast is suitable for operating known lamps which are generally designed for operation at a lamp voltage of approximately 90 V and can be operated on a ballast in the form of a ballast coil.

In addition to Na, the filling of the discharge vessel may comprise Tl and/or one of the rare earth metals, with which a desired value for the general color rendering index $Ra \geq 80$ and the color temperature T_c between 2700 K and more than 4200 K is realized. In this description and claims, the elements Y and the lanthanides are considered as rare earth metals. Due to the formation of compounds with O_2 in ceramic discharge vessels based on metal oxide, Sc is not suitable as a filling constituent.

A drawback of the known lamp is that it has a relatively low specific light output. A further drawback of the known lamp is that, also as a result of the relatively small dimensions of the discharge vessel, a relatively rapid blackening of the wall of the discharge vessel occurs, inter alia, due to deposition of evaporated material on the wall of the electrodes, so that the lumen maintenance and hence the practical lifetime of the lamp is influenced very detrimentally.

It is an object of the invention to provide a measure to combat the described drawbacks while maintaining the satisfactory color properties of the lamp. According to the invention, a lamp as described in the opening paragraph is therefore characterized in that the relation $EA/Di \geq 2$ is satisfied, and in that, during nominal operation of the lamp, a lamp voltage Vla satisfying the relation $Vla \geq 110$ V is present across the lamp.

In the lamp according to the invention, it has surprisingly been found that a specific light output above 100 lm/W in combination with a value for the general color rendition $Ra > 80$ can be realized. The lamp voltage Vla is preferably at most 400 V. Higher

voltages do not lead to a significant improvement of the properties of the lamp but require special efforts for realizing a suitable electronic ballast.

A relatively large electrode distance EA provides the possibility of applying a relatively low wall load, which is favorable for the lifetime of the lamp. During nominal operation, the lamp according to the invention preferably has a wall load Wla which satisfies the relation $30 \leq Wla < 70$ in W/cm^2.

In a preferred embodiment of the lamp according to the invention, the discharge vessel also comprises Ce halide. This has the important advantage that a further increase of the specific light output (efficacy) is obtained while maintaining the satisfactory color properties of the light generated by the lamp. In addition to Na, the filling of the discharge vessel may comprise one or more other metals which form halides, inter alia, for influencing the color properties of the lamp, such as Tl, Dy, Ho and Tm, for example, for raising the color temperature. Moreover, an addition of Ca halide is also suitable.

It holds for Hg that, as is customary for metal halide, it is completely in the vapor phase in its operational state and constitutes the most important lamp voltage-determining value. It has also been found that Hg influences the color rendition. Notably for realizing values for the general color rendition $Ra > 80$, a sufficiently high pressure of the Hg appears to be necessary. To prevent a too high lamp voltage Vla, on the one hand, and an insufficiently high pressure of the Hg, on the other hand, the ratio EA/Di is preferably ≤ 5.5.

These and other aspects of the invention are apparent from and will be elucidated with reference to the embodiment(s) described hereinafter.

In the drawing:

Fig. 1 shows a lamp according to the invention,

Fig. 2 is a cross-section of a discharge vessel of the lamp shown in Fig. 1, and

Fig. 3 shows the lamp of Fig. 1, connected to an electronic ballast.

Fig. 1 shows a metal halide lamp comprising a discharge vessel 3 shown in a cross-section and not to scale in Fig. 2 and having a ceramic wall enclosing a discharge space 11 which contains an ionizable filling in the lamp shown of not only Hg and a quantity of Na halides but also Tl and Dy and Ce halides. Two electrodes 4, 5 with electrode bars 4a, 5a and tips 4b, 5b are arranged in the discharge space at a mutual distance EA, in the drawing each of W. The discharge vessel has an internal diameter Di at least through the distance EA. The discharge vessel is sealed at one side by a ceramic projecting plug 34, 35 which tightly

encloses a current feedthrough conductor 40, 41 and 50, 51 with an interspace to the electrodes 4, 5 arranged in the discharge vessel and is connected thereto in a gastight manner by means of a melt-ceramic compound 10 near one end remote from the discharge space. The discharge vessel is enclosed by an outer envelope 1 provided at one end with a lamp cap 2. In the operational state of the lamp, a discharge extends between the electrodes 4, 5. Electrode 4 is connected via a current conductor 8 to a first electric contact which forms part of the lamp cap 2. Electrode 5 is connected via a current conductor 9 to a second electric contact which forms part of the lamp cap 2. The metal halide lamp shown is intended to be operated on an electronic ballast as is shown in Fig. 3. The lamp indicated by L in Fig. 3 is connected by means of electric contacts of lamp cap 2 to connection points C, D of a commutator III, for example, a bridge circuit. A, B denote input terminals of the ballast and are intended for connection to a power supply source, for example, a mains of 220 V, 50 Hz. In the ballast, I denotes rectifier means and a preconditioner for generating a DC voltage for power supply of a converter II. Very suitable as a preconditioner is, for example, an up-converter or boost converter for withdrawing a current, which is sinusoidal in a good approximation, from the mains operating as the power supply source. A suitable example of a converter is a down-converter or a Buck converter. Another type of circuit which is usable as a converter II is a flyback converter. During nominal operation of the lamp shown, a lamp voltage Vla satisfying the relation $Vla \geq 110$ V is present across the lamp. The lamp voltage is measurable between the electric contacts which form part of the lamp cap 2 and, in a good approximation, corresponds to the voltage between the electrode tips 4b, 5b.

In a first, practical embodiment of lamps according to the invention and as shown in the drawings, the nominal power of the lamp is 39 W. The translucent wall of the discharge vessel has a thickness of 0.8 mm. The ionizable filling of the lamp comprises, in addition to Hg, 5.5 mg of Na+Tl+Dy+Ce iodide with a composition of 85.3; 3.6; 4.8 and 6.3 in mol%. Moreover, the discharge vessel comprises Ar as a starter with a filling pressure of 400 mbar. Table I states further data and results. For lamp Prototype 1 the Hg filling amount is 2.1 mg and for lamp Prototype 2 it is 2.5 mg.

Table I

Prototype	Hg µg/mm^3	Di(mm)	EA (mm)	EA/Di	V_{la} (V)	Δλ (nm)	Efficacy (lm/W)	Ra	T_c (K)	T_{kp}(K)	W_{bel} (W/cm^2)
1	30	3	8	2.67	150	7.5	107	88	2940	1300	51
2	25.5	3	12	4	200	5.3	115	82	2930	1280	35

In a second practical embodiment of lamps according to the invention, the nominal power of the lamps is 75 W. Table II states the data and results of these lamps.

Table II

Prototype	Hg µg/mm^3	Di (mm)	EA (mm)	EA/Di	V_{la} (V)	Δλ(nm)	Efficacy (lm/W)	Ra	T_c (K)	T_{kp} (K)	W_{bel} (W/cm^2)
1	24.5	4	12	3	205	4.3	118	87	2940	1330	50
2	24	4	15	3.75	245	3.2	117	85	2960	1295	40
3	25	4	9	2.25	175	5.3	110	91	2950	1345	66

In a further practical embodiment of a lamp according to the invention, the filling of the discharge vessel comprises 5.75 mg of Na, Tl, Dy, Ce iodide in a weight ratio of 64.3; 6.0; 13.1 and 16.5. The nominal power of the lamp is 75 W. The electrode distance EA is 12 mm, the internal diameter is 4 mm which corresponds to a wall load W_{bel} of 49.7 W/cm^2 in the operational state. During operation, a Hg pressure of 35 bar prevails in the discharge vessel

and the lamp voltage Vla is 232 V. The lamp having a specific light output value of 109 lm/W emits light at a color temperature T_c of 2800 K with a value of 90 for the general color rendering index Ra.

For a comparable lamp, the values of EA and Di are 9 mm and 4.5 mm, respectively, the Hg pressure during operation is 43 bar and the lamp voltage Vla is 202 V. The specific light output values, T_c and Ra of this lamp are 106 lm/W, 3050 K and 93, respectively. In this case, the wall load Wla is 59 W/cm^2. For a lamp with a discharge vessel of the same construction, the Hg pressure during operation is 31 bar. The lamp operated in a vertical position has a lamp voltage of 147 V, a specific light output of 115 lm/W, a color temperature T_c of 3670 K of the emitted light and an Ra value of 82.

In a further practical embodiment of the lamp according to the invention, the nominal power of the lamp is 39 W. The electrode distance EA is 8 mm, the internal diameter Di is 3 mm. In addition to Hg with a pressure of 31 bar in the operational state, the filling of the discharge vessel comprises 5.7 mg of Na, Ca, Ce, Dy - iodides in a mol% of 47; 39.2; 7.7; 6.1. For a 100-hour lifetime of the lamp, lamp properties were measured with the following results: lamp voltage Vla 174 V; specific light output 106 lm/W; color temperature T_c 3965 K; general color rendering index Ra 89. After a lifetime of 1000 hours, these measured values were 178 V; 101 lm/W; 3801 K; 87, respectively.

A further practical lamp of a corresponding construction and nominal power is provided with 1 mg of Hg and 5.6 mg of Na, Ca, Ce, Dy iodide in a mol% of 45.2; 37.7; 11.2; 5.9. The lamp voltage for lifetimes of 100 hours and 1000 hours was 150 V and 153 V, respectively. The value of the specific light output was 106 lm/W and 102 lm/W, respectively. The associated values for the color temperature T_c and the general color rendering index Ra were 4648 K and 84, and 4569 K and 84, respectively.

CLAIMS

1. A metal halide lamp intended to be operated on an electronic ballast, which lamp comprises a discharge vessel having a ceramic wall enclosing a discharge space which contains an ionizable filling comprising, in addition to Hg, a quantity of Na halide, two electrodes with tips being arranged at a mutual distance EA, and the discharge vessel having an internal diameter Di at least through the distance EA, characterized in that the relation $EA/Di \geq 2$ is satisfied and in that, during nominal operation of the lamp, a lamp voltage Vla satisfying the relation $Vla \geq 110$ V is present across the lamp.

2. A lamp as claimed in claim 1, characterized in that the lamp voltage Vla is at most 400 V.

3. A lamp as claimed in claim 1 or 2, characterized in that, during nominal operation, it has a wall load Wla which satisfies the relation $30 \leq Wla < 70$ in W/cm^2.

4. A lamp as claimed in claim 1, 2 or 3, characterized in that the ratio EA/Di is preferably ≤ 5.5.

5. A lamp as claimed in claim 1, 2, 3 or 4, characterized in that the discharge vessel also comprises Ce halide.

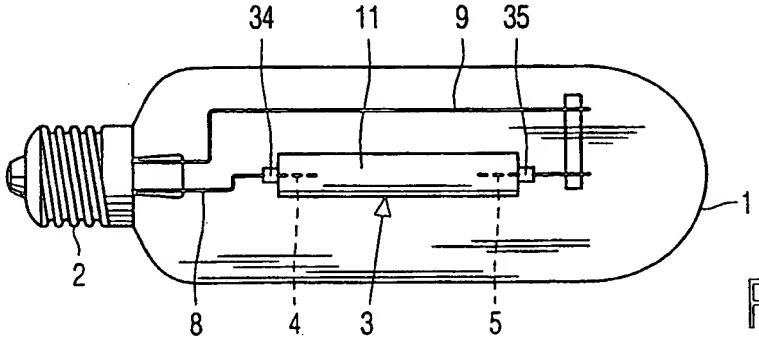
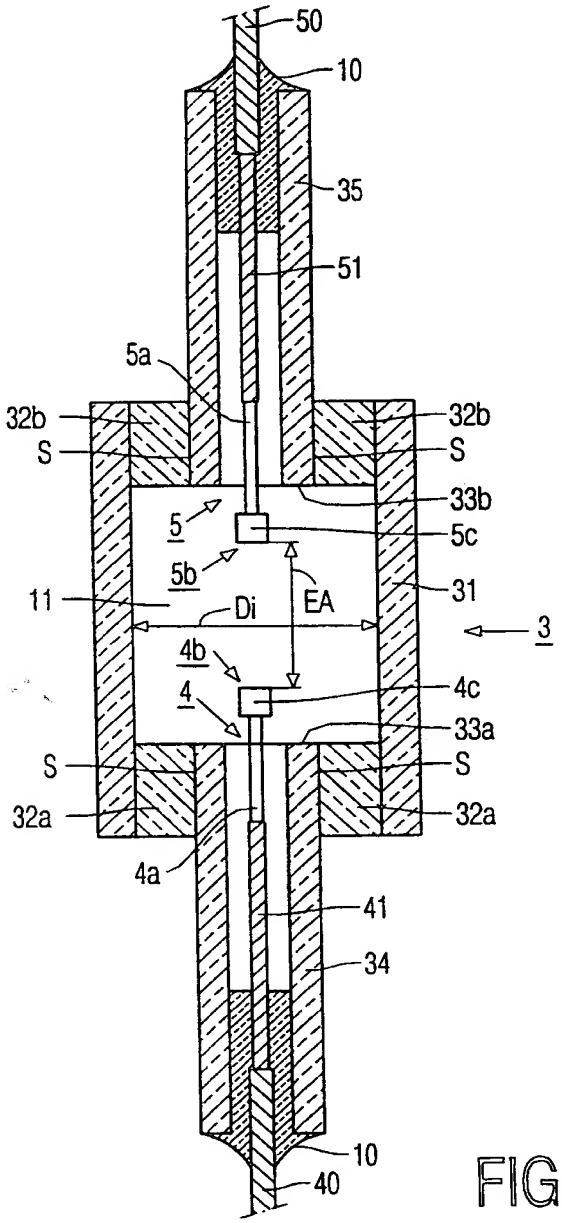

34
11
9
35
1
2
8
4
3
5

FIG. 1


50
10
35
51
5a
32b
S
32b
S
33b
5
5c
5b
11
Di
EA
31
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4b
4
4c
33a
S
S
32a
32a
4a
41
34
10
40

FIG. 2

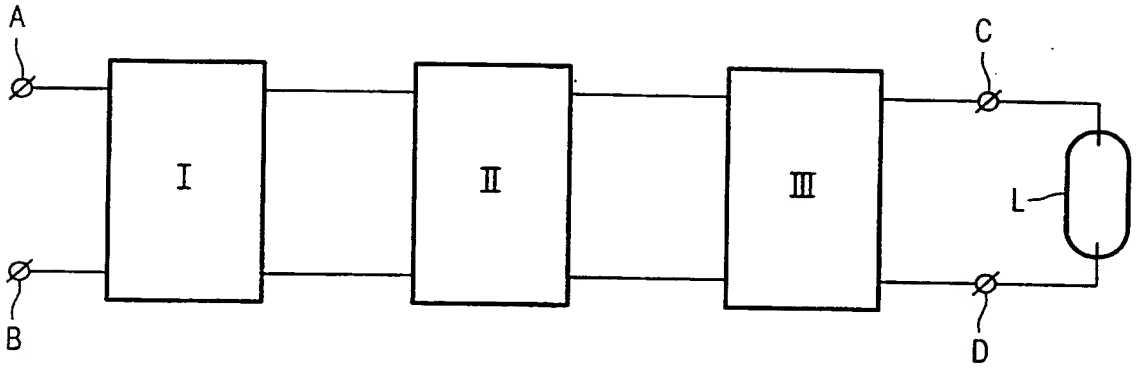

FIG. 3

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01J61/82

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01J

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 25294 A (PHILIPS ELECTRONICS NV ;PHILIPS NORDEN AB (SE)) 11 June 1998 (1998-06-11) abstract; claims 1,2; figure 2 page 4, line 25 - line 28 page 7, line 12 - line 13 page 7, line 27 - line 34 ---	1-5
X	US 3 639 801 A (JACOBS CORNELIS ADRIANUS JOANN ET AL) 1 February 1972 (1972-02-01) abstract; claim 1 column 2, line 50 - line 52 column 3, line 7 - line 34 column 3, line 45 - line 58 column 4, line 5 - line 17 column 4, line 24 - line 52 ---	1-4
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Interr. ıal Application No
PCT/EP 00/00216

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 161 672 A (CAP DANIEL M ET AL) 17 July 1979 (1979-07-17) abstract; claim 1; table 1 column 2, line 61 -column 3, line 10 column 8, line 45 - line 56 column 10, line 36 - line 40	1-4
X	US 5 525 863 A (KOWALCZYK LOU ET AL) 11 June 1996 (1996-06-11) column 7, line 40 -column 8, line 5	1,2,4
P,X	WO 99 28946 A (KONINKL PHILIPS ELECTRONICS NV ;PHILIPS AB (SE)) 10 June 1999 (1999-06-10) abstract; claims 1-3; figure 2 page 2, line 2 - line 24 page 3, line 4 - line 12 page 3, line 30 - line 31 page 4, line 13 - line 15 page 5, line 31 -page 6, line 4	1,2,4,5
A	WO 97 42650 A (PHILIPS ELECTRONICS NV ;PHILIPS NORDEN AB (SE)) 13 November 1997 (1997-11-13) cited in the application abstract; figure 2 page 1, line 8 - line 19 page 2, line 5 - line 21 page 2, line 34 -page 3, line 30 page 6, line 20 - line 23 page 7, line 6 - line 14	1
A	WO 98 49715 A (KONINKL PHILIPS ELECTRONICS NV ;PHILIPS AB (SE)) 5 November 1998 (1998-11-05) abstract; figure 2	1
A	EP 0 286 247 A (EMI PLC THORN) 12 October 1988 (1988-10-12) abstract column 1, line 1 - line 9 column 2, line 29 - line 32 column 2, line 39 - line 44 column 2, line 50 - line 53 column 3, line 49 -column 4, line 1 column 4, line 58 -column 5, line 11 column 9, line 20 - line 23	1-3
A	US 4 724 361 A (WADA SHIGEAKI ET AL) 9 February 1988 (1988-02-09) column 8, line 33 - line 36 column 9, line 19 - line 32 column 10, line 52 -column 11, line 22	1,4

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INTERNATIONAL SEARCH REPORT

Intern ıal Application No
PCT/EP 00/00216

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 215 524 A (PHILIPS NV) 25 March 1987 (1987-03-25) abstract; claim 1 page 3, line 12 - line 19 page 5, line 4 - line 13 page 9, line 10 -page 10, line 3 page 13, line 4 - line 36	1,3
A	EP 0 443 964 A (WELCH ALLYN INC) 28 August 1991 (1991-08-28) abstract; claim 18; figure 2 page 6, line 35 - line 43 page 6, line 54 - line 57 page 7, line 50 - line 53	1,4
A	US 4 253 037 A (DRIESSEN ANTONIUS J G C ET AL) 24 February 1981 (1981-02-24) abstract; claim 4 column 3, line 34 - line 38 column 4, line 32 - line 40 column 4, line 64 - line 67 column 5, line 46 - line 50 column 6, line 27 - line 29	1,2

1

INTERNATIONAL SEARCH REPORT

information on patent family members

Interr :al Application No
PCT/EP 00/00216

Patent document cited in search report	Publication date	Patent family member( )	Publication date
WO 9825294 A	11-06-1998	CN 1210619 A	10-03-1999
		EP 0896733 A	17-02-1999
		JP 2000501563 T	08-02-2000
		PL 328092 A	04-01-1999
		US 5973453 A	26-10-1999
US 3639801 A	01-02-1972	NL 6909891 A	29-12-1970
		AT 297848 B	15-03-1972
		BE 752550 A	28-12-1970
		DE 2028781 A	07-01-1971
		FR 2051304 A	02-04-1971
		GB 1272545 A	03-05-1972
		SE 355106 B	02-04-1973
US 4161672 A	17-07-1979	AU 505333 A	15-11-1979
		BE 868764 A	05-01-1979
		BR 7804360 A	03-04-1979
		CA 1111483 A	27-10-1981
		CH 635957 A	29-04-1983
		DD 138925 A	28-11-1979
		DE 2826733 A	18-01-1979
		ES 471432 A	01-10-1979
		FR 2397066 A	02-02-1979
		GB 2000637 A,B	10-01-1979
		IT 1096968 B	26-08-1985
		JP 1452128 C	25-07-1988
		JP 54063567 A	22-05-1979
		JP 62053904 B	12-11-1987
		JP 59103270 A	14-06-1984
		MX 145363 A	27-01-1982
		NL 7807285 A,B,	09-01-1979
		SE 435333 B	17-09-1984
		SE 7807546 A	06-01-1979
US 5525863 A	11-06-1996	DE 69323578 D	01-04-1999
		DE 69323578 T	19-08-1999
		EP 0581359 A	02-02-1994
		JP 6162996 A	10-06-1994
WO 9928946 A	10-06-1999	EP 0956582 A	17-11-1999
WO 9742650 A	13-11-1997	CA 2226556 A	13-11-1997
		CN 1196826 A	21-10-1998
		EP 0838081 A	29-04-1998
		JP 11509679 T	24-08-1999
		US 5923127 A	13-07-1999
WO 9849715 A	05-11-1998	EP 0910866 A	28-04-1999
		JP 2000501564 T	08-02-2000
EP 0286247 A	12-10-1988	AT 60166 T	15-02-1991
		GR 3001547 T	23-11-1992
		JP 63257179 A	25-10-1988
		US 4910432 A	20-03-1990
US 4724361 A	09-02-1988	JP 61165999 A	26-07-1986
		DE 3543986 A	26-06-1986
		FR 2574990 A	20-06-1986

Form PCT/ISA/210 (patent family annex) (July 1992)

INTERNATIONAL SEARCH REPORT

information on patent family members

Interr nal Application No
PCT/EP 00/00216

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US 4724361 A		JP	1939774 C	09-06-1995
		JP	6065023 B	22-08-1994
		JP	62097251 A	06-05-1987
		GB	2169440 A,B	09-07-1986
		GB	2211658 A,B	05-07-1989
		JP	2076367 C	25-07-1996
		JP	6030244 B	20-04-1994
		JP	62090843 A	25-04-1987
EP 0215524 A	25-03-1987	NL	8502509 A	01-04-1987
		AT	45056 T	15-08-1989
		AU	6258586 A	19-03-1987
		BR	8604319 A	05-05-1987
		CA	1263138 A	21-11-1989
		CN	1008030 B	16-05-1990
		DD	249567 A	09-09-1987
		ES	2005822 A	01-04-1989
		FI	863659 A	14-03-1987
		HU	42203 A,B	29-06-1987
		JP	62066556 A	26-03-1987
EP 0443964 A	28-08-1991	US	5144201 A	01-09-1992
		AU	633178 B	21-01-1993
		AU	7095091 A	29-08-1991
		CA	2036901 A	24-08-1991
		CN	1058862 A	19-02-1992
		DE	69102791 D	18-08-1994
		DE	69102791 T	24-11-1994
		ES	2025500 A	16-03-1992
		JP	4218253 A	07-08-1992
		ZA	9101321 A	24-12-1991
US 4253037 A	24-02-1981	NL	7801972 A	24-08-1979
		AT	379709 B	25-02-1986
		AT	126779 A	15-06-1985
		AU	522231 B	20-05-1982
		AU	4433579 A	30-08-1979
		BE	874313 A	20-08-1979
		BR	7901043 A	02-10-1979
		CA	1118832 A	23-02-1982
		DE	2906383 A	23-08-1979
		ES	477871 A	16-12-1979
		FR	2418546 A	21-09-1979
		GB	2015243 A,B	05-09-1979
		HU	181472 B	28-07-1983
		IN	150128 A	31-07-1982
		IT	1111542 B	13-01-1986
		JP	1033900 B	17-07-1989
		JP	1555757 C	23-04-1990
		JP	54124574 A	27-09-1979